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PATENT AND TECHNICAL TRANSLATION

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DECLARATION

The undersigned, Olaf Bexhoeft, hereby states that he is well acquainted with both the English and German languages and that the attached is a true translation to the best of his knowledge and ability of the German text of PCT/EP2004/051406, filed 07/08/2004, and published on 01/27/2005 as WO 2005/007406 A2, and of forty-two (42) amended claims.

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.

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Specification

Method and Device for Influencing the Fan-Out Effect

The invention relates to methods and a device for affecting the fan-out effect in accordance with claims 1, 2, 4 or 29.

A system for controlling the fan-out affect is known from USP 6,553,908 B1, wherein by means of at least one, better yet two, first sensors spaced apart in the axial direction, means for affecting the fan-out effect are controlled, and by means of measured values from a least a second sensor means for controlling the lateral registration are controlled.

A device for correcting the lateral registration of the imprinted material is known from DE 85 10 912 U1, which has blowing air nozzles outside of the transport plane in the end area of a follow-up printing group. A supporting force is applied to the web by means of charging the nozzles with compressed air in order to deflect them in the desired manner.

DE 195 01 373 U1 discloses a device for the continuous correction of the fan-out effect. In this case a signal from a sensor arranged in the edge area of the imprinted web is processed in a control device and set commands are put out to an appropriate actuating member for the introduction of rollers. In one embodiment, set commands can also be supplied to an actuating member for the circumferential registration by this control device processing the mentioned

signal, in another embodiment, the circumferential registration takes place together with a lateral registration regulation in a separate control device different from the above mentioned control device by means of a separately determined measuring signal.

The object of the invention is based on creating methods and a device for affecting the fan-out effect.

In accordance with the invention, this object is attained by means of the characteristics of claims 1, 2, 4 or 29.

A substantial advantage to be obtained by means of the invention consists in that rapid and dependable correction of the lateral registration, as well as the fan-out effect, is possible with the lowest possible outlay.

The integration of the two measuring processes and/or controls or algorithms makes possible a correction which fulfills the conditions while reducing the outlay.

Exemplary embodiments of the invention are represented in the drawings and will be described in greater detail in what follows.

Shown are in:

Fig. 1, an overview of a printing press,

Fig. 2, a schematic representation of webs of different width,

Fig. 3, a printing unit,

Fig. 4, a schematic view from above on a first exemplary embodiment of a device for affecting the fan-out effect,

Fig. 5, a schematic view from above on a second or third exemplary embodiment of a device for affecting the fan-out effect.

A printing press, in particular a web-fed rotary printing press for imprinting one or several webs B, has several units 100, 200, 300, 400, 500, 600, 700, 800, 900 for provisioning, imprinting and further processing. For example, the web B to be imprinted, in particular a paper web B, is wound off a roll unwinding device 100 before it is supplied via a draw-in unit 200 to one or several printing units 300. In addition to the printing units 300, which are standardized for multi-color printing (for example four of them for four-color printing), it is possible to provide further printing units 300, which in this case can be utilized in alternation with one or several of the remaining printing units for flying printing forme changes.

In an advantageous embodiment a varnishing unit 400 can be provided in the web path.

Following imprinting and, if required, varnishing, the web B passes through a dryer 500 and is possibly cooled again in a cooling unit 600 if drying is performed thermally. A further conditioning unit such as, for example, a coating device and/or re-moistening device, not represented in Fig. 1, can be provided downstream of the dryer 500 in or downstream of the cooling unit 600. Following cooling and/or conditioning, the web B can be supplied via a superstructure 700 to a folding apparatus 800. The superstructure 700 has at least one silicon unit, longitudinal cutter and turning device, as well as a hopper unit, not represented in Fig. 1.

The mentioned silicon unit can also be arranged upstream of the superstructure 700, for example in the area of the cooling unit 600. Furthermore, the superstructure can have, not represented in Fig. 1, a perforating unit, a gluing unit, a numbering unit and/or a plow folder. After passage through the superstructure 700, the web B, or partial webs, are conducted into a folding apparatus 800.

In an advantageous embodiment the printing press in addition has a separate transverse cutter 900, for example a so-called plano delivery device 900, in which a web B which, for example, had not been conducted through the folding apparatus 800, is cut into standard sheets and, if desired, stacked or delivered.

The units 100, 200, 300, 400, 500, 600, 700, 800, 900 of the printing press have an effective width transversely in respect to the transport direction T of the web B, which permits processing of webs B of a maximum width b, or web width b (Fig. 2) of, for example, up to 1,000 mm. Here, the effective width is understood to be the respective width, or clear width, of the structural components (for example, rollers, cylinders, passages, sensor devices, actuating paths, etc.) of the units 100, 200, 300, 400, 500, 600, 700, 800, 900, which work together with the web B directly or indirectly, so that the web B can be processed, conditioned and conveyed in its full width b. The functionality (material supply, web transportation, sensor devices, further processing devices) of the units 100, 200, 300, 400, 500, 600, 700, 800, 900 is designed in such a way that webs B' of only partial width down to a width b' of only 400 mm can be processed in the printing press.

The units 100, 200, 300, 400, 500, 600, 700, 800, 900 which define, or process, a section length a are designed in such a way that for example they define a section a of a length between 540 and 700 mm on the web B. The section length a advantageously lies between 540 and 630 mm. In a special embodiment the section length a lies at 620 ± 10 mm. In a further development of the printing press the units 100, 200, 300, 400, 500, 600, 700, 800, 900 are designed in such a way that with a few changes the printing press can be selectively designed with section lengths of 546 mm, 578 mm or 620 mm. Thus, for example, substantially only an exchange capability of bearing elements for printing group cylinders (see below), a matching of the drive mechanism (see below), as well as matching in the folding apparatus 800 or the transverse cutter 900 (see below), are required for the change in order to equip the same printing press for formats which differ from each other. For example, in a standard way the section length a is covered by four vertical printed pages, for example DIN A4, side-by-side in the transverse direction of the web B, and two printed pages (for example of a length s) one behind the other in the longitudinal direction. However, depending on the print image and the subsequent further processing in the superstructure 700 and the folding apparatus 800, other numbers of pages per section length a are also possible.

For multi-color imprinting of the web B, B', the printing press has several, for example at least four, here in particular five identically equipped printing units 300. The printing units 300 are preferably arranged one next to the other, and a web B, B' passes horizontally through them.

The printing unit 300 is preferably designed as a printing unit for offset printing, in particular as a double printing group 300, or as an I-printing group 300, with two printing groups 301, for example two offset printing groups 301 for two-sided printing by means of the so-called rubber-against-rubber process. Rollers 302 are arranged upstream and downstream at least in the lower area, and optionally in the upper area of at least one of the printing units 300, by means of which an incoming web B, B' can be conducted around above or below the printing unit 300, or a web B, B' conducted around an upstream located printing unit 300 can be passed through the printing unit 300, or a web B, B' passed through the printing unit 300 can be conducted around the downstream located printing unit 300.

Fig. 3 schematically shows the arrangement of two printing groups 301 working together via the web B, B', each with printing cylinders 303, 304 embodied as a transfer cylinder 303 and as a forme cylinder 304, an inking system 305 and a dampening system 306. In an advantageous embodiment, per forme cylinder 304, the printing unit 300 has devices 307 for semi- or fully-automatic plate feeding, or changing of a printing forme 310, for example a printing plate 310.

In a further embodiment, in particular if the printing press is intended to be suitable for imprinting operations, at least one or several printing units 300 have additional guide elements closely ahead of and behind the nip point of the printing unit 300. If a web B, B' is to pass without being imprinted and without contact between it and transfer cylinder 303, the web guidance with the use of the guide

elements 308, shown in dashed lines in Fig. 3, is advantageous. The web B, B' passes through the nip point in such a way that it substantially forms an angle between 80° and 100°, preferably approximately 90°, with a connecting line of the axes of rotation of the two transfer cylinders 303. Preferably the guide elements 308 are designed as rods or rollers, around which air flows. This reduces the danger of previously freshly applied ink rubbing off.

In a further development of the represented printing group 301, a washing device 309 is assigned to each transfer cylinder 303. The elastic surface of the transfer cylinder 303 can be cleaned by means of the washing device 309.

Each of the cylinders 303, 304 has a circumference between 540 and 700 mm, wherein preferably the forme and the transfer cylinder 303, 304 have the same circumference. In an advantageous manner the circumferences lies between 540 and 630 mm. In a special embodiment the section length a lies at 620 ± 10 mm. In a further development, the printing unit 300 is designed in such a way that, with a few changes, the cylinders 303, 304 can be selectively designed with circumferences of 546 mm, 578 mm or 620 mm. Thus, for example, substantially only an exchange of bearing elements or a changed position of the bores in the lateral frame (and the lug, see below) for the cylinders 303, 304, and a matching of the drive mechanism (lever, see below) takes place.

The transfer cylinder 303 has a least one, non-represented dressing on its circumference, which is held in at least one groove extending axially on the shell face. Preferably the transfer cylinder 303 only has one dressing

extending over the effective length, or substantially over the entire width of the web B, B' to be imprinted, and substantially extending (except for a joint or a groove opening) around the entire circumference of the transfer cylinder 303. Preferably the dressing is designed as a so-called metal printing blanket, which has an elastic layer (for example rubber) on a substantially dimensionally stable support layer, for example a thin metal plate. Now the ends of this dressing are inserted through an opening in the shell face into the groove and are held there by frictional or positive contact. In the case of a metal printing blanket the ends are bent/beveled off (for example, in the area of its leading end by approximately 45°, and in the area of its trailing end by approximately 135°). These ends extend through an opening of a groove extending over the entire usable width of the transfer cylinder 303, which for example also has an arresting, clamping or tensioning device. The opening to the groove in the area of the shell face preferably has a width between 1 and 5 mm, in particular less than or equal to 3 mm, in the circumferential direction of the cylinder 304. The clamping device is advantageously embodied to be pneumatically operable, for example in the form of one or several pneumatically operable levers, which in the closed state are pre-tensed by a spring force against the trailing end extending into the groove. A hose which can be charged with a pressure medium can preferably be employed as operating means.

Besides an ink feeding device, for example an ink fountain 311 with an actuating device 312 for regulating the ink flow, the inking system 305 has a plurality of rollers

313 to 325. The ink-conducting device can also be designed as a doctor blade crosspiece. With the rollers 313 to 325 placed against each other, the ink moves from the ink fountain 311 via the duct roller 313, the film roller 314 and a first inking roller 315 to a first distribution roller 316. Depending on the mode of operation of the inking system 305 (see below), from there the ink moves via at least one inking roller 317 to 320 to at least one further distribution cylinder 321, 324, and from there via at least one application roller 322, 323, 325 to the surface of the forme cylinder 304. In an advantageous embodiment the ink moves from the first distribution cylinder 316 over several possible paths selectively or simultaneously (in series or parallel) via two further distribution cylinders 321, 324 to the application rollers 322, 323, 325. In an advantageous embodiment of the inking and dampening system 305, 306, the second distribution cylinder 324 can work together with a roller 328, for example an application roller 328, of the dampening system 306 at the same time.

The roller 328 works together with a further roller 329 of the dampening system 306, for example a distribution roller 329, in particular a traversing chromium roller 329. The chromium roller 329 receives the dampening agent from a moistening arrangement, for example a roller 330, in particular a dipping roller 330, which dips into a dampening agent supply 332, for example a water fountain. A drip pan 335 is preferably arranged underneath the water fountain for catching condensation water forming on the water fountain which, in an advantageous embodiment, is designed to be heatable, for example by means of a heating spiral.

In a further development, the inking system 305 has, besides the rollers 313 to 325, at least one further roller 236, by means of which ink can be removed from the inking system 305, in particular upstream of the first distribution cylinder 316. This takes place in that this roller 326 itself or, as represented, a roller 327 working together with it, can be placed against an appropriate removal device 333 (Fig. 3).

The printing unit 300 - in particular a (second and/or third and/or fourth and/or possibly fifth) printing unit 300 following the first printing unit 300 has in its inlet area, or in the area of its inlet nip between the two transfer cylinders 303 a device 336 for affecting the fan-out effect, i.e. for affecting a change in the transverse extension/width of the web B, B' from one print location to the other, caused by the printing process (in particular moisture). The device 336 is preferably arranged in the inlet area of a printing unit 300 following the first printing unit 300, i.e. once the web has been imprinted at least once. It has at least an actuating member 338, for example a support element 338, by means of which, either with a contact of the web B, B', or advantageously without a contact, the latter can be deflected in a direction perpendicularly to the web plane.

To this end at least one support element 338 embodied as a nozzle 338 is arranged on a cross-beam 337 (Fig. 4) in such a way that gas, in particular air, flowing out of it is directed onto the web B. B'. Depending on the force of the flow, when passing through this area the web B, B' undulates more or less, or is deflected out of a substantially level cross section, which results in a correction of the width b,

b' and of the lateral alignment of each partial area of the printed image. Advantageously, at least five, in particular seven nozzles 338 are for example arranged axially side-by-side. If desired, support elements 338 which are offset in respect to each other can also be arranged on both sides of the web B, B', which engage each other in the manner of teeth over the web and deform the web B, B' in an undulating manner. The force of the air flow, for example per nozzle 338, is preferably set by means of non-represented servo valves. In the course of this it is possible to assign a pressure from 0 to a maximum value to each nozzle 338, for example manually, via a control or a regulating device. It is also possible to basically assign the same value to all nozzles 338, but to set the type and strength of the correction, for example waviness or deflection, at opened nozzles 338 by the specific selection of a partial amount (less or equal to the total number of the nozzles 338).

In an advantageous embodiment, the nozzles 338, at least the nozzles 338 located the farthest outward, or all nozzles 338 except those located in the center, are arranged, adjustable in the axial direction, on the cross beam 337. The adjustability can take place by means of techniques for manual setting (loosening and displacing, manually operable spindle(s), etc.), or by means of drive mechanisms (for example motors). The latter is particularly advantageous if the axial positioning, or at least pre-setting, is performed automatically by the machine control device on the basis of the intended width b, b' for imprinting the web B, B'.

The device 336 for affecting the fan-out effect receives its setting commands from a control device 339,

which in turn receives the measured values for the lateral position of markers sequentially imprinted by the various printing groups (with different colors), (partial) printed image portions, or (partial) printed images, from at least one downstream arranged sensor 341. It is intended in what follows to understand the term partial printed image, or partial printed image portion, to mean one of several sequentially applied colors of the same printed image or partial printed image, often called a "color separation" of one of the colors to be printed. A printed image composed, for example, of four ink colors, then has four color separations, i.e. four partial printed images of the colors to be applied on top of each other.

Two markers M1.1, M1.2, applied by a first printing unit 300.1, which are spaced apart from each other in the axial direction, and two markers M2.1, M2.2 applied by a second printing unit 300.2, are represented by way of example in Fig. 4 wherein, in a correct setting of the press, the markers identified by Mx.1, and the markers identified by Mx.2 are respectively intended to lie in the same alignment to each other (i.e. an axial distance is zero) or, in another embodiment, at least at an axially fixedly predetermined finite distance (predetermined values) from each other. Preferably a number of marker pairs (Mx.1, Mx.2), which corresponds to the number of printing units 300 imprinting the web B, B', has been applied.

A series of respectively one marker M1, M2 applied per printing unit 300 (first embodiment), or a series of definite image points or image areas of partial printed images (second embodiment), is sufficient for merely determining the lateral

registration (in the coordinate cross in Fig. 4 a relative position of the markers following each other, viewed in the x direction). For lateral registration regulation or correction, preferably only the relative axial position of these sequentially imprinted markers M1, M2, etc. (or image points) in respect to each other is checked and, in case of a deviation from a relative nominal position (for example distance zero), the printing groups, or the forme cylinder 304 carrying the printed image, are aligned in respect to each other until the nominal position is correct and the partial printed images assume the required position in respect to each other in the axial direction. In this case a nominal position (reference) is preferably defined by means of the position of one of the imprinted markers M1, M2, etc. as the reference marker - in particular, in case of a combination with the fan-out regulation described below, advantageously the position of the first applied marker M1 from the first printing unit 300 -, and the remaining printing units 300, or markers M2, etc. are oriented in accordance with that. This means that the regulation of the partial printed images here preferably takes place in relation to each other, and not absolutely in respect to the measurement location, or the stationary sensor 341. In principle, the same can be applied to the definition of the nominal position of a partial printed image portion, or partial printed image, wherein then, for example, the first partial images (or defined image points of the first partial image) are used as reference, and the remaining partial printed images (or image points of the remaining partial printed images) are aligned in respect to it. Relative

nominal positions of the remaining partial printed images for reference can be obtained, for example, from the recorded measurement data of a print considered to be good, or advantageously can directly be the image data of the print pre-stage.

In the economical embodiment represented in Figs. 4 and 5, no separate sensors detecting the printed image are exclusively arranged for the device 336 for affecting the fan-out effect, but use is made of the measured values from a lateral registration control/regulation device 342, or vice versa. This means that the lateral registration/regulation device 342 and the device 336 make use of the measured value of at least one common sensor 341. The lateral registration control/regulation device 342 aligns the respective partial printed image (in one color) as a whole in its axial position. To this end the forme cylinder 304, or the printing forme 310 located on the cylinder 304, is appropriately axially moved in respect to the web B, B', for example by means of an actuating member or actuating means 343. Now, the sensor arrangement and, if required, portions of the lateral registration control/regulation device 342, are employed for triggering the device 336 for affecting the fan-out effect, or vice versa.

So that in a parallel manner the sensor arrangement 341 of the lateral registration control/regulation device 342 is also usable for the device 336 for affecting the fan-out effect, in an advantageous first embodiment (Fig. 4) the sensor arrangement 341 has at least two measuring points, i.e. sensors 341, arranged side-by-side in the axial direction, which detect respectively one partial printed

image portion located on the web B, B', or the above mentioned imprinted markers M1.1, M1.2, M2.1, M2.2. The sensors 341 can be embodied as image sensors, for example as reading heads with the appropriate evaluation software of a system for color registration regulation. If the partial printed image as a whole differs in a lateral direction from its nominal position (reference marker or reference image point), a correction takes place at the printing group (forme cylinder 304), causing the deviation via the actuating means 343 for lateral registration, but if the evaluation of the measurement (markers M1.1, M1.2, M2.1, M2.2, or partial image points) shows that, although the partial printed image has assumed the correct axial position, there is a distortion/widening of the partial printed image in comparison to the reference, correction takes place via the device 338 for affecting the fan-out effect. In a case of mixed effects, both corrections take place, of course, wherein a cycle of first correcting the lateral registration and then the distortion is of advantage.

By means of the markers from two printing units 300 represented by way of example, an evaluation is explained by way of example in what follows. The markers M1.1, M1.2 should be defined here as reference markers and, for the sake of simplicity, the required axial distance of following markers M2.1, M2.2 of a series should equal zero - i.e. they should be aligned with the reference. Preferably, the imprinted markers M1.1 and M1.2, preferably viewed axially, are located in a center imprinted area which - assuming a correct web run - also approximately corresponds to the area of the web center M. They can also be at a distance from the

center of the printing area/web area known from the printing formes. In the case represented, the evaluation of the four markers M1.1, M1.2 shows a deviation of the second partial printed image in the lateral registration which, in this case, substantially corresponds to the axial distance between the two center markers M1.1 and M2.2, and to a fan-out, which substantially corresponds to the distance between the outer markers M2.1 and M2.2, less a possibly existing lateral registration error. In the present case the lateral registration error must be added to this distance between the outer markers (or, a lateral registration error with a negative operational sign must be subtracted), since in this case the lateral registration error and the fan-out error have effects on the two different sides of the web B, B'.

Therefore, in an advantageous embodiment of the first exemplary embodiment, one of the sensors 341 (and the associated markers M1.1, M2.1) are arranged substantially centered in respect to the running web B, B', or the full imprinted image width, and the other in an area close to the edge. In this way it is possible to make a quick statement, independent of the fan-out effect, regarding the lateral registration, and to achieve at the same time the largest possible resolution in the course of determining the fan-out effect.

If the sensor 431 for detecting the lateral registration is not always arranged centered in respect to the web B, B', this combined procedure is advantageous to the extent that a statement regarding an error in the lateral registration can only be made after having knowledge of the extent of fan-out. By means of a simultaneous, or parallel,

processing it is possible to avoid an erroneous interpretation of a signal employed by the lateral registration control/regulation device 342, for example. Thus, knowing at least one of the two measurement locations (or image points, see below), an extrapolation towards the web center is possible, from which the size of the lateral registration error can be derived as a rule.

Therefore the control device 339 and the lateral registration control/regulation device 342 can be modules of a common program, for example, whose steps are sequentially and, if required cyclically, performed, wherein a common algorithm, for example, is assigned to the interpretation of the measured values and subsequent error correction.

The control device 339 and the lateral registration control/regulation device 342 can also be embodied as two calculation algorithms which are separate from each other, but which preferably are coupled to each other.

It is possible in these cases to provide one unit in accordance with software or hardware technology, here identified as control device 345, for both matters.

However, the control device 339 for affecting the lateral registration and the lateral registration control/regulation device 342 can also be embodied as structurally separated hardware units. For example, this is advantageous when retrofitting existing arrangements, or when making use of finished accessories wherein, however, preferably a signal connection at least for transmitting the lateral registration error to the lateral registration control/regulation device 342 should be provided.

In an advantageous further development the markers M1.1, M1.2, M2.1, M2.2, or at least a series of markers M1.1, M2.1, and/or M1.2, M2.2 of successive printing units 300, are evaluated regarding their position, or a spacing in the transport direction, in respect to each other or to a reference marker, in order to correct the circumferential registration (color registration) of the partial printed images in relation to each other (in the coordinate cross in Fig. 4 a relative position of the markers following each other, viewed in the y direction). If a deviation of one or several partial printed images exists, the circumferential registration is corrected in that the respective printing group, or its forme cylinder 304, is rotated in relation to its angular position in respect to the other / to the reference printing group by non-represented actuating means, or by the individual drive mechanism. This evaluation, and respective triggering, if required, can also be performed from the control device 345.

In further development, the positions or distances between successive markers M1.1, M2.1 and M1.2, M2.2 of both series are evaluated regarding their position, or distances, relative to each other in the transport direction, or to a reference marker. If, viewed in the transport direction (y) of the web B, B', an error in the distance between the markers M1.1, M2.1 of the one series deviates from an error in the corresponding distance between the markers M1.1, M2.2 of the other series, an angular error in one of the partial printed images - for example caused by an exposure error when producing the printing forme, or erroneous placement on a cylinder - can be deduced. The respective partial printed

image then is rotated by an angle ϕ in respect to the other. This error is then counteracted by placing at least one of the forme cylinders into an oblique position, which is called the setting of an oblique registration, or cocking.

For example, the fan-out effect, together with the lateral registration (x direction) and/or the circumferential registration (y direction) and/or the oblique registration, are thus monitored and evaluated by means of the sensors 341 and/or the control device 345.

In a second exemplary embodiment, a single sensor 341, which detects the printed image at least over a scanning width b341, is arranged in place of the two sensors 341, which point by point detect the two series of markers, wherein the scanning width b341 covers at least the position of the two series of markers. In the course of evaluating the recorded image from the sensor 341 which, for example, is embodied as a line camera or planar camera (see below), initially a recognition of the markers M1.1, M1.2, M2.1, M2.2 (in different colors), for example designed in the form of crosses, takes place by means of appropriate image processing software, and subsequently an evaluation in the manner as described in connection with the first exemplary embodiment.

In a third exemplary embodiment again a sensor 341, which detects the printed image of the partial printed images of different colors at least over a scanning width b341 extending significantly in the axial direction, is arranged in place of the two sensors 341 detecting the printed image and/or the markers point by point. Significant scanning width here means a width which allows the detection of two sufficiently axially spaced-apart from each other image

points of a partial printed image (of one color) by means of the observed portion. These advantageously should lie apart sufficiently far that a change in the relative axial distance of the two image points spaced apart from each other can be detected with the required resolution. Two partial printed areas, which are axially spaced apart from each other, or two image points, or two image point groups of the same partial printed image now take the place of the two markers M1.x, M2.x of the same partial printed image. Again - corresponding to what had been said above - the partial printed images are brought into congruence as best as possible in that the lateral registration, the fan-out, the circumferential registration and/or the oblique registration are evaluated by means of the image detected by the sensor 341 and are corrected. Here, imprinted markers M1.1, M2.1 defined as reference markers are not used a references, instead data defining preset nominal values are stored, preferably for each of the partial images (colors). In this connection, in one embodiment - as already indicated above - defined image points of the first partial imprinted image can be used as reference, and the remaining partial printed images (or image points of the partial printed images) can be aligned using this reference. Relative nominal positions in regard to this reference of the remaining partial printed image, or their image points can, for example, be obtained from the recorded measured data of a print considered to be good, or advantageously directly from image data of the printing pre-stage. In another embodiment the relative positions of the relevant reference points (image points) of all partial printed images (colors) in respect to each other

are obtained via the printing pre-stage and are stored as relative nominal positions in respect to each other.

Since the effects of the relative displacement (fan-out) of the image points grows with increasing web width b, b', the minimum scanning width b341 in the second and third exemplary embodiments - taking into account the resolution of appropriate cameras and the expected quality of the printed image - should be at least a quarter of the web width b maximally to be processed in the printing press. In an improved embodiment, the scanning width b341 is at least half of this web width b and covers the printed image of the entire web half, starting at the web center M. In this variation the fan-out effect - which as a rule is formed approximately symmetrically - on one half of the web can be accurately determined and suitable counter-measures (individual, profiled triggering of nozzles, rollers, etc.) can be determined and introduced, matched to it. Advantageously the entire scanning width b341 is evaluated in respect to the expansion change (fan-out). Here, the width of the sensor 341 is not to be understood as the scanning width b341, but the width of its field of coverage on the web B, B', which is schematically indicated in Fig. 5 by dashed (diverging) lines.

Preferably, in the second and third exemplary embodiment an image sensor 341, for example a color camera 341, in particular a digital semiconductor camera 341 with at least one CCD chip, can be arranged as the sensor 341 at the outlet of the printing unit 300 of the printing press, which is the last one in the transport direction of the web B, B', and its image-recording area can preferably be aimed

immediately and directly on the web B, B', wherein the image-recording area of the image sensor 341 advantageously has at least the entire web width b, b' as the scanning width b341 in the transverse direction. Thus, the image sensor 431 picks up an image which can be electronically evaluated, of the entire width b, b' of the imprinted web B, B'. The image sensor 341 is, for example, designed as a planar camera 341. Then the recorded image is evaluated in regard to lateral registration, as well as fan-out and, if required, in regard to circumferential registration and/or oblique registration, in an electronic evaluating device of the image sensor 341 itself and/or in the control device 345 having the fan-out control device 339 and/or the lateral registration control/ regulation device, and subsequently actuation orders, if required, are issued to the respective actuating means 338, 343. The two image sensors 341 of the first exemplary embodiment can each be embodied as image sensors 341 having, in particular, a CCD chip.

In a further development, in case of the embodiment of the sensor 341 as a sensor 341 detecting the print image over the entire width b, other parameters relevant to the printing process can be controlled, or evaluated by an appropriate evaluation unit and, in case this is required, can be controlled automatically, so to speak, by means of programs running in the evaluating unit. The evaluation and correction of several parameters relevant to the printing process can take place here practically parallel by means of the same evaluating unit, for example the control unit 345. It is possible in a particularly advantageous manner to evaluate the image which was recorded by the image sensor 341

in the course of a production run of the printing press and forwarded in the form of a mass of data to the appropriate evaluating unit to determine whether the print image actually recorded in the image and evaluated has a change in the tone value in comparison with a previously recorded and evaluated printed image (or in comparison with a stored reference), i.e. an actually recorded image is checked during a running process in comparison with a reference image. If the result of the check is a change in the tone value, it is possible in a manner only schematically symbolized by an actuating member 347, to change the color density, or the metering and/or the supply of ink to the printing press (in one or several printing groups 304) by means of appropriate actuating commands (setting of the color metering devices, setting a roller and/or ink temperature).

In the second and third exemplary embodiment the employment of a line camera with permanent illumination is also possible as an alternative to the preferred planar camera - in particular with a flash lamp -.

In place of the nozzles 338 it is also possible in principle to arrange rollers (not represented), which touch the web B, B' or, in a particularly advantageous manner, support elements 338 which guide the web B, B' in a contactless manner, and have on their side facing the web B, B' micro-openings through which compressed air flows. In contrast to the nozzles 338, the micro-openings do not form a sharp air flow, but instead an air cushion between the surface and the web B, B'. In this case the control device 339 acts on actuating drives, which move the support elements 338 in a direction perpendicularly in respect to the web

plane. The micro-openings have a diameter of less than 500 μm, advantageously less than or equal to 300 μm, in particular less than or equal to 150 μm. In one embodiment these can be open pores of a porous material constituting the effective surface on the support element 338, in particular a sinter material with pores of a mean diameter (mean size) of less than 150 μm, for example 5 to 60 μm, in particular 10 to 30 μm. In another embodiment these represent the outward directed openings of micro-bores of a diameter of less than or equal to 300 μm, in particular between 60 and 150 μm.

As indicated in Fig. 3 and already mentioned above, in an advantageous embodiment the printing group 301 has the device 307 for the - at least semi-automatic - changing of a printing forme 310 on the assigned forme cylinder 304. The device is designed in two parts and has a contact pressure device 344, also called "semi-automatic changer" 344, arranged in the area of a nip point between the forme and transfer cylinders 303, 304, and a magazine 346, structurally separated from it, with feeding and receiving devices for the printing formes 310.

List of Reference Symbols

100	Unit, roll unwinding device
200	Unit, draw-in unit
300	Unit, printing unit, double-printing group, I-printing group
301	Printing group, offset printing group
302	Roller
303	Cylinder, transfer cylinder
304	Cylinder, forme cylinder
305	Inking system
306	Dampening system
307	Devices for semi- and fully automatic plate feeding
308	Guide element
309	Washing device
310	Printing forme, printing plate
311	Ink fountain
312	Actuating device
313	Roller, duct roller
314	Roller, film roller
315	Roller, inking roller
316	Roller, distribution cylinder
317	Roller, inking roller
318	Roller, inking roller
319	Roller, inking roller
320	Roller, inking roller
321	Roller, distribution cylinder
322	Roller, application roller

323	Roller, application roller
324	Roller, distribution roller
325	Roller, application roller
326	Roller
327	Roller
328	Roller, application roller
329	Roller, distribution roller, chromium roller
330	Roller, dipping roller
331	-
332	Dampening agent supply
333	Removal device
334	-
335	Drip plate
336	Device for affecting the fan-out effect
337	Cross beam
338	Actuating means, support element, nozzle
339	Control device
340	-
341	Sensor
342	Lateral registration control/regulation device
343	Actuating means
344	Contact pressure device, semi-automatic changer
345	Control device
346	Magazine
400	Unit, varnishing unit
500	Unit, dryer
600	Unit, cooling unit
700	Unit, superstructure
800	Unit, folding apparatus
900	Unit, transverse cutter, plano delivery device

a	Section length
s	Length
b	Width, web width (B)
b'	Width, web width (B')
B	Web, paper web
B'	Web, paper web
M	Center of Web
T	Transport direction